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REMARKS

This is in response to the Office Action dated February 21, 2001. Applicant requests that the time period to respond to the Action be extended one month, from May 21, 2001 to June 21, 2001. A check in the amount of \$110 is enclosed for the one-month extension fee.

The Claim Rejections

In the last Office Action, Claims 1-4 and 6-8 were rejected under 35 USC 102(b) as being anticipated by JP 02138438 to Akiyama et al. Claims 1-4 and 6-8 were rejected under 35 USC 102(b) as being anticipated by GB 1,085,715 to Escher Wyss Aktiengesellschaft ("EWA"). Claims 1-8 were rejected under 35 USC 102(e) as being anticipated by U.S. Patent No. 5,948,353 to Lawrence et al. Claims 1 and 3-7 were also rejected as being unpatentable over GB 737,510 to Madsen in view of Akiyama et al or Lawrence et al.

Summary of the Invention

Applicant's invention is directed to improvements in thermal fatigue and wear-resistance by a balance of additives which avoids a detrimental micro-structure with inner-granular carbide eutectic phases and also gives higher wear-resistance. The composition comprises both vanadium and titanium with the weight of vanadium present being less than or equal to one-half the weight of copper present added to 20 times the weight of titanium present. Improved wear and frictional properties are achieved without the problems of hot-spotting and manufacturing difficulties

The Argument

It is noted first that Claim 1 has been amended to incorporate the titanium range from original Claim 5 and also the vanadium range from original Claim 6. Consequently, these

two claims have been canceled. All other claims in the application remain dependent upon either Claim 1 or Claim 2.

The Anticipation Rejection

As stated in the MPEP, Section 2131, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. (citing case) The identical invention must be shown in as complete detail as is contained in the claim. (citing case)

With respect to the Examiner's rejection of Claims 1-4 and 6-8 as anticipated by Akiyama et al, every element as set forth in the claim is not found in the reference. To the contrary, the added limitation to the titanium range introduced into the claim is outside of Akiyama et al's titanium range of 0.05 to 0.1 weight percent, and indeed, the Examiner apparently recognized this since Claim 5, from which the titanium range was taken, was not rejected as anticipated by Akiyama et al. Furthermore, if the calculation required in Claim 1 is performed using Akiyama et al's ranges, it will be found that Akiyama et al's formulations will fall outside the copper range specified. Specifically, Claim 1 requires the total weight of hard carbide-forming metals to be one unit when copper is 1.8 to 3 units. Akiyama et al specifies a minimum of 0.4 weight percent molybdenum and a minimum of 0.05 weight percent chromium. This would mean that the molybdenum and chromium content requires 0.81 weight percent of copper to "balance" these metals. Applicant's titanium and vanadium minimums total 0.375 weight percent which requires a further minimum of 0.675 weight percent copper so that the total copper requirement would be 1.485 weight percent, which is well outside applicant's specific range of 0.5 to 1.2, indicating that Akiyama et al's composition contains far more

hard carbide-forming metals than is the case with the invention of Claim 1.

In reference to the rejection of Claims 1-4 and 6-8 as anticipated by EWA, again the Examiner has not alleged Claim 5 to be anticipated by this reference, and it follows that since the titanium range of the reference is outside the titanium range now specified in the claim, this rejection should be withdrawn. Also, it should be noted that EWA's range of 0.1 to 1.0 weight percent titanium is specified as an option which is very far removed from applicant's range. Furthermore, if the calculation required by Claim 1 is carried out on EWA's data, it will be found that this will result in more copper than applicant has specified. Specifically, EWA requires a minimum of 0.5 weight percent of chromium, and when vanadium and titanium are both present, the minimum is 0.1 percent. This gives a total of 0.7 which, when multiplied by 1.8, gives 1.26 weight percent copper which is outside of applicant's specified range.

In the Examiner's third rejection, Claims 1-8 were all anticipated by Lawrence et al. Lawrence et al specifies that the composition contains a minimum of 0.25 weight percent molybdenum and between 0.3 and 1.0 weight percent copper. Since applicant's Claim 1 now recites a minimum of 0.375 weight percent of titanium and vanadium, this gives a total of hard carbide-forming metals of 0.625 weight percent. According to the formulation specified in Claim 1, this gives a minimum of 1.25 weight percent copper, whereas Lawrence et al requires there to be less than 1.0 weight percent copper. In response to the Examiner's comment about Claim 2, if chromium is included, even more copper will be required magnifying the difference between Claim 2 and Lawrence et al.

The Obviousness Rejection

The Examiner also rejects Claims 1 and 3-7 under 35 USC 103(a) as being unpatentable over Madsen in view of Akiyama et al or Lawrence et al. This rejection is respectfully traversed. To establish a *prima facie* case of obviousness, there must be some motivation or suggestion to one of ordinary skill in the art to modify the reference or to combine reference teachings. There must be a reasonable expectation of success and the teaching or suggestion must come from the references and not from applicant's disclosure. It must be noted that Madsen is specifically concerned with the manufacture of piston rings, whereas the present invention is directed to disc brake rotors. The two fields of concern present significantly different sets of problems which must be addressed. On the one hand, the function of a disc brake rotor is to provide a high friction surface to enable a vehicle to be stopped as quickly as possible. On the other hand, a piston ring functions to seal the gap between cylinder walls and a piston which reciprocates within the cylinder. It is essential to efficient performance of an engine that there be low friction between the piston ring and the cylinder wall since friction results in energy loss and is contrary to the principles of effectively sealing relatively movable surfaces. Accordingly, the requirement for disc brake rotors and for piston rings are so contradictory that it would be in the highest degree unlikely that one of ordinary skill in the art would even consider looking to the piston ring art, let alone be motivated by it, for design assistance in the manufacture of a disc brake rotor. It follows that Madsen would not be a legitimate starting point for considering the patentability of the present invention, and it is not proper to combine this reference with the teachings of Akiyama et al or Lawrence et al which come from an art where the problems confronting the inventor are so materially different. Even though Madsen refers to low wearing and increased strength for his piston

rings, the Examiner should read Madsen's teachings in the light of the piston ring art where the rings are reciprocating in sliding contact with the cylinder walls continuously over long periods of time under a light load. In contrast, a disc brake rotor receives very high loads for short periods of time.

Furthermore, even assuming that Madsen is an appropriate reference for an obviousness rejection, if Madsen is compared with amended Claim 1 which specifies a minimum of 0.35 weight percent vanadium, Madsen's formulation requires that there be at least 0.058 weight percent titanium giving a total of titanium and vanadium of 0.408 weight percent which Madsen would balance with a minimum of three times as much copper resulting in a minimum of 1.224 weight percent copper, which is significantly outside the range as specified in Claim 1. There is no teaching in this reference, either alone or in combination with the remainder of the references, which would lead one of ordinary skill in the art to applicant's invention.

Summary

In summary, in connection with all references applied by the Examiner, it is fair to say that none disclose nor suggest the formula recited in applicant's Claim 1. None suggest the presence of vanadium, titanium and copper in the percent ranges specified. Akiyama et al specifies a range of copper of 0.2 to 2.0 weight percent indicating the copper may be less than molybdenum which is specified as a minimum of 0.4 weight percent.

EWA's teachings are that vanadium and titanium are far from being essential and in combination are optional extras and that copper may be less than the chromium content alone. In Lawrence et al, the titanium and vanadium are optional

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extras. Indeed, Lawrence et al seems to suggest them as alternatives while calling for molybdenum and chromium in amounts which may be greater than that of copper. It is clear, indeed, that in Lawrence, copper is an optional extra. It is maintained that the teachings of these references, taken alone or in combination, cannot fairly be said to constitute an anticipation or a fair teaching which would render applicant's claims to be obvious.

Prompt and favorable action as to all claims is respectfully requested.

Respectfully submitted,

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Version with Markings to Show Changes Made

1 (three times amended). A disc brake rotor having a grey cast iron composition, wherein said composition comprises between 0.5 and 1.2% by weight of copper, and a plurality of hard carbide forming metals including both vanadium and titanium, the vanadium content being between 0.35 and 0.45% by weight and the titanium content being between 0.025 and .035% by weight, the ratio between the weight of copper present and the total weight of said hard carbide forming metals being 1.8 to 3 units of copper to 1 unit of the hard carbide forming metals.

Please cancel Claims 5 and 6.

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